

## **Version 0.4**

# **Component Selection and Evaluation Process For the Real-Time DII COE**

### **Purpose:**

This paper documents the process used by the Real-Time DII COE Technical Working Group (TWG) for selecting and evaluating candidate components for inclusion in the Real-Time DII COE. The outputs of this process are TWG recommendations to the DII COE Architecture Oversight Group (AOG) and Engineering Office.

### **References/Sources of Guidance:**

The following documents are referenced or were used as guidance in the creation of this paper. In addition, draft material prepared by John Maurer and Tiffany Frazier was extensively used.

- Defense Information Infrastructure Common Operating Environment Integration and Runtime Specification, Version 3.1, October 1998.  
<http://spider.dii.osfi.disa.mil/cm/general.html>
- Design Review Information for DII COE Components  
[http://coeeng.ncr.disa.mil/REFERENCE\\_PAGES/DESIGN2-24.HTM](http://coeeng.ncr.disa.mil/REFERENCE_PAGES/DESIGN2-24.HTM)
- COTS Inclusion in the DII COE  
[http://coeeng.ncr.disa.mil/REFERENCE\\_PAGES/JCSCOT/JCSCOT.HTM](http://coeeng.ncr.disa.mil/REFERENCE_PAGES/JCSCOT/JCSCOT.HTM)

### **Background:**

The Real-Time DII COE TWG has a responsibility to provide technical advice and consultation to the DII COE AOG and Engineering Office. Part of this responsibility is recommending and commenting on components that are being considered for inclusion in the Real-Time DII COE.

According to the Integration and Runtime Specification (paragraph 2.1.6), a component, or function, can be part of the COE if it meets one or more of the following general criteria:

1. The function is part of the minimum software required to establish an operating environment context. This is normally provided by COTS products and includes the operating system, windowing software, security software, and networking software.

2. The function is required to establish basic data flow through the system. To be useful, a system must have means for communicating with the external world. To be efficient, consistent, and robust, a system must also have standard techniques for managing data flow internal to the system.
3. The function is required to ensure interoperability. Standards alone cannot guarantee interoperability, but using common software for common functions and using shared and universal database segments with DOD 8320 standard data objects comes much closer. As an example from the GCCS mission domain, a USMTF message parser is part of the COE because interoperability cannot be achieved if two different message parsers implement a different set of assumptions about the USMTF message specification or uses a different specification revision.
4. The function is of such general utility that if rewritten it constitutes appreciable duplicative effort. This includes printer services, an alerts service for disseminating alerts, and a desktop environment for launching operator-initiated processes.

(Again from the Integration and Runtime Specification) The first three criteria listed above are technical in nature because they dictate from an architectural perspective what software must be contained in the COE for a given mission domain. The fourth criteria, however, is more programmatic in nature because it is often a tradeoff between the cost of modifying a legacy system to remove duplication versus the cost of maintaining duplicative code, the cost of potentially requiring additional hardware resources because of duplication, and the cost of operator training when there are different ways to accomplish the same action. DII compliance requires that there be no duplication of functions in the first three criteria but some flexibility is possible for the fourth.

The following process is designed to help the TWG make meaningful contributions to the DII COE with respect to their assessment of potential DII COE components. In addition, our intent is to improve efficiency and communication by having a documented process, available to any interested parties, that captures how the TWG arrives at its recommendations. The steps in the process should be followed sequentially.

#### **Process:**

1. **Component is nominated to the Real-Time TWG as a candidate for the RT COE.** Nomination is by a Real-Time TWG Service/Agency representative, the AOG, or the DII Engineering Office. The nominating organization must, at the time of nominating, provide answers to the questions contained in Table 1. Usually, design reviews are held only for components that are new to the DII COE. Version upgrades and patches are normally not grounds for a design review.
2. **The TWG voting members assign a TWG subgroup to be the TWG Responsible Subgroup for this component.** As an alternative, a TWG member can be assigned this responsibility. In all cases, all members of the TWG, regardless of membership

in any subgroup, can participate in the evaluation of the component and the drafting of the recommendations. It is expected that multiple RT TWG subgroups should be involved in the evaluation. The assignment of a Responsible Subgroup is intended merely to aid in the orderly assessment of the product. The Responsible Subgroup must ensure that all TWG members are allowed to contribute to this process.

3. **The TWG Responsible Subgroup conducts a “first cut” evaluation of the product based on the material identified in Table 1.** It also identifies alternative products that might satisfy the same DII COE requirements.
4. **The Responsible Subgroup briefs the TWG on their findings.**
5. **The TWG Service/Agency representatives vote on whether to proceed to a Design Review.** If the vote is negative, the nominating TWG representative, or the Chair in the case that the AOG or Engineering Office was the nominator, provides written feedback to the nominating organization. This feedback must be approved by the TWG Service/Agency representatives prior to being given to the nominating organization. The TWG Chair is responsible for placing a copy of the feedback and a record of the vote in the TWG’s permanent repository.
6. **The TWG Chair hosts the Design Review.** The nominating organization is responsible for preparing for the design review by complying with the entrance conditions identified in Table 2. The purpose of this is to expose and prepare the Real-Time TWG ahead of the design review so that the design review can proceed efficiently. The design review must start with a review of the applicable DII COE requirements met by this component. This review of requirements should provide a mapping to show all of the requirements satisfied by this component. Following the requirements review, the meeting should transition to covering the items listed in Table 3. The goal of the design review is to understand how the component being reviewed really works and how it is structured, both architecturally, and as a segment. The nominating organization is responsible for providing answers to these design review questions. TWG members are free to ask questions that are not contained in Table 3. Note that the material in Table 3 is largely the same as that identified on DISA’s “Design Review Information for DII COE Components” web page. Modifications were made to help assess the component’s suitability for use in real-time systems. These modifications are italicized.

Specifics of design reviews, such as whether a contractor or the nominating organization briefs the TWG, the length of the review, and whether there should be a product demonstration will vary based on the component being evaluated. The TWG will work with the nominating organization in developing a suitable agenda for the meeting. Note that most DII COE design reviews last less than eight hours. Issues may arise during a review that necessitate that another design review (really a continuation of the first) be held at a later date.

7. **The Responsible Subgroup prepares a report documenting the results of the Design Review.** There are no specific pass/fail criteria for a design review. The TWG needs to collectively weigh the information in deciding what its recommendations and conclusions will be. All TWG Service/Agency representatives do not need to agree on all recommendations and conclusions. The report should document where there are dissenting Service/Agency views and what those views are. Dissenting views of non-Service/Agency representatives will not be included in the report.
8. **The TWG Service/Agency representatives vote to approve the Design Review Report.** The TWG Chair forwards the report to the AOG and DII Engineering Office. The nominating TWG representative is responsible for reporting the results to the nominating organization. The TWG Chair is responsible for placing a copy of the report in the TWG's permanent repository. This completes the formal process.

**Table 1. Initial Nominating Questions**

1. What basic problem(s) is the product intended to solve? What is the essence of the problem(s)?
2. Provide an executive summary/overview of how the product provides a solution(s) to this problem(s)?
3. For what computing host configuration(s) is the product intended? What is the complete list of target hosts supported by the submitted version of this product?
4. Does this product currently exist in a formal software release, and, if so, what is the exact version designation and title for the product? Is this the exact version being submitted as a DII COE component, and, if not, why not?
5. What are the significant DII COE SRS requirements that are met by this product?
6. Does the product have sponsor(s) commitment to carry it through the selection process?
7. Which military programs currently use or plan to use this product?
8. Does the product conflict or overlap with other products already in the DII COE?
9. Is the product acceptable to the associated functional TWG?
10. Is the product JTA compliant?
11. Are there any potential issues in including this product in the DII COE?

**Table 2. Design Review Entrance Conditions**

1. Data should be provided in advance of the design review in common electronic formats, including MS Office and PDF.
2. Answers to the questions contained in Table 3. should be provided in advance to allow time to study the data prior to the actual review. Two weeks in advance is suggested.
3. The product supplier should identify any classified or proprietary data contained in the design review package.
4. The product supplier must grant permission to distribute, including posting on the RT TWG Web site.
5. The product supplier certifies that all answers provided are, to the best knowledge and belief of the product supplier, true, accurate, and complete.

**Table 3. Design Review Questions**

1. Architecture: How the component works as an application, design of the component. Is there a server piece, client piece, does it operate standalone, does it have connectivity requirements, etc?
2. Resource Information: Resource estimates with respect to memory, tape, disk, performance, data file sizes, etc. <i>For each supported host, what are the minimum resources required? Maximum? Average/typical?</i>
3. Network discussion: Discuss how the segment is distributed around the LAN/WAN, what servers it expects to access and the flow of how configuration and execution takes place. If client/server, how does the client find the server, etc.? Discuss bandwidth utilization issues and the impact of specific implementation (Broadcast, Push/Pull, etc...).
4. Security architecture: Discuss as applicable (strategy for rwx permissions on files, auditing, etc.) <i>Is the product intended for use in classified systems? Is it intended for use in multilevel security environments? Are there any aspects of the design, implementation, or behavior of the product that have adverse implications for its use in classified or multilevel security environments? Is the product classified, and, if so, what is its classification?</i>
5. Segment Format: Discussion of how this effort is packaged into segments. How the segment is actually formatted (i.e. Segment types, etc.). <i>Is the product available in binary executable image, shared runtime library (dynamically linkable), statically linkable object library, and/or source code formats?</i>
6. COE Compliance: Target level of COE compliance, with strategy to achieve level 7/8
7. Standards Compliance: List of standards followed by the segment (e.g. POSIX). <i>Identify and describe all proprietary interfaces</i>
8. External Software requirements: List of all COTS, or OS items required by the segment to make it work. This list should include commercial version numbers for the COTS products. This list should cover, which OS are covered by the product (i.e. Solaris 2.5.1, HP-UX 10.20, and NT 4.0, etc.).
9. Segment dependencies: Discuss the dependencies and/or conflicts as documented in SegDescrip files. <i>List and describe all installation, operational, runtime, and functional dependencies on other segments.</i>
10. Functional Duplication: List of current segments that have functions/features the proposed effort may duplicate, and a rationale for why the duplication and strategy for resolving duplication.
11. Keyboard Mappings: List of all assumed keyboard mappings to be added to the system.
12. Color map usage: Discuss any taking over of the palette, etc. If the products can use an extreme amount of colors, is it configurable?
13. Menu/Icon Additions: Discuss any menus and or icons that are added to the system by the application.
14. Installation Process: Discussion of installation flow, especially with respect to duties for the segment's PostInstall and process when segment is replaced or updated in the field. This should really tie the segment format of #5 in with the architecture of #1. Is there an installation order, etc.? <i>This will be impacted if/when DISA concurs that some COE components need to be made available to system developers (DoD contractors) in forms</i>

<i>other than executable binary applications.</i>
15. User Interface: GUI walkthrough (identify style guide issues)
16. Testing Requirements: Testing information (what testing has been done) Discussion of functional testing completed by sponsor. Discussion of certification testing completed, if applicable. <i>To what standards and/or specifications has the product been tested? Approximately what percentage of test coverage (e.g., in terms of total executable instructions and execution paths) is provided by testing done to date? What certifications, if any, has the product earned? How many known errors exist in the version of the product being submitted to the DII COE? What is the nature of these known errors/problems?</i>
17. Risks: Risks associated with the segment (i.e. people, machine, and other resource limitations). <i>Is the product certified for use in systems or situations where the product may, directly or indirectly, have an effect on the safety of persons or property? If so, list and describe all such certifications.</i>
18. Approval Items: List of any items which require Chief Engineer approval, as per the I/RTS. (Boot processes, background processes, and shared memory requirements, Root directive in Seg Info file, etc.)
19. Software Licensing Issues: Highlight COTS licensing required, if applicable. Provide product comparison information, if license required. Additionally, elaborate on the license scheme used by the product line (i.e. software key, node locked, server only, etc.).
20. Is the component Y2K compliant? If it is not, then provide the plan for how and when the component will be compliant. If there are any question on Y2K compliance reference the Y2K web page.
21. Documentation: Based on the CM delivery checklist, which of these documents will be delivered, and which ones will need to be waived from the Chief Engineer. Also map the COTS documents to the appropriate CM requirements, so they will be understood at delivery time. Note: This is the time to get waivers on documents that are N/A to the product. Waivers will not be given at delivery time and your product will be rejected.
22. Is the component exportable to foreign entities? This statement needs to be included in the delivery letter also. Our Foreign Military Sales group needs to know this information for every component in the DII COE.
23. Have the applicable working groups reviewed the component? If so which working groups and what were the recommendations?
24. <i>Describe how and under what circumstances the product achieves predictable timewise behavior. Identify features that do not offer predictable execution times.</i>
25. <i>Identify all schedulable entities (processes, threads) and shared resources. Identify scheduling parameters (e.g., priorities) and how they are established. Characterize triggering events and resource requirement. For each host platform supported (see question 1), list the minimum, maximum and typical resource requirements for each schedulable entity. Include the minimum and maximum number of each such entity that may exist simultaneously, or provide an algorithm for computing these numbers (e.g., 'one per mobile target track').</i>
26. <i>Identify code regions in which preemption is prohibited. Identify upper bound on maximum non-preemptable time periods. For each non-preemptable critical region, for each supported host, provide maximum and typical cpu time durations during which</i>

<p><i>preemption cannot occur, AND provide the number of times per second this critical region will be or may be executed. What is the average frequency of execution? Minimum interval between executions? Statistical distribution characterizing frequency of execution and/or execution time?</i></p>
<p><i>27. Identify mechanisms to prevent deadlock and to bound other scheduling anomalies such as priority inversion.</i></p>
<p><i>28. Characterize the real-time performance of this product: Timings, capacities, jitter, jitter tolerance?, etc.</i></p>
<p><i>29. If applicable, how will the segment work in a multiprocessor environment?</i></p>
<p><i>30. Development and Integration Environments. Describe the preferred development environment (and options, if any). What assumptions does this product impose on the development environment (required or recommended tools), specific compilation systems, profilers, etc? What development tools does this package provide? What is development system cost, including cost of developer seat and run-time licenses?</i></p>
<p><i>31. Run-time Environment. What are the run-time requirements on operating system and kernel services (with respect to selectable services)? Are there mechanisms for configuring the product to improve responsiveness and predictability? For example, locking code or data in memory, adjusting scheduling parameters. Over what range can scheduling parameters be set, e.g., can “real-time” priorities be used by the application?</i></p>
<p><i>32. Interoperability. Can this product operate on other DII COE platforms (non-real-time or real-time) as well? Which ones? Characterize differences. Will this product interoperate with similar DII COE segments? What constraints are imposed? e.g., compatible IIOP for real-time and non-real-time CORBA products.</i></p>